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PRESENT CONDITION
OF THE
EASTERN OYSTER EXPERIMENT
AND THE
NATIVE OYSTER INDUSTRY,

REPORT
OF
THE STATE BIOLOGIST

JUNE 30, 1900.



SALEM, OREGON
W. H. LEEDS, STATE PRINTER
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BIOLOGICAL LABORATORY,
UNIVERSITY OF OREGON,
EUGENE, January 30, 1900. }

His Excellency, T. T. Geer, Salem, Oregon :

I take pleasure in presenting to you herewith a report on the status of the Eastern Oyster experiment, conditions of the native oyster industry, etc., and include several tables of densities and water temperatures taken within the last three years, and mailed to Washington, D. C., but not hitherto published here.

I should like to emphasize at the very beginning of the report a few points which I regard as important, viz. :

1. *I have been very careful in this work to state to the public as facts only what we have actually found to be true, and have been extremely conservative in statements which might lead our citizens to expect immediate results.*

2. *We know that the introduced oyster flourishes, grows with extreme rapidity, and soon becomes an excellent marketable product.*

3. *We know that they spawn here.*

4. *We have found a few young oysters undoubtedly hatched in Yaquina Bay.*

Public opinion appears to have decided, with questionable propriety, that, as far as successful propagation is concerned, the experiment is a failure, and many of the oystermen of Yaquina Bay, being intensely practical and not at all scientific, share this view. Similar work on the Atlantic Coast (I refer to the experiments of John A. Ryder, see Report of Commissioner of Fish and Fisheries for 1885), *demonstrating that oyster spat can be obtained in enormous amounts by resorting to pond culture, prove that we have no right to draw hasty conclusions as regards our work here.*

I have no hesitation in saying that, even should we be unsuccessful in propagating the introduced species here, there is profit, much profit, for an individual, or a company, provided ground could be secured for such purpose, in importing seed oysters from the east, planting them in our bays (they will grow in almost any of our bays), and selling to home trade a year or two years or more later. As is well known, an immense business of this kind is conducted at San Francisco. Now, then, if pond culture of embryo oysters can be resorted to here (I have already alluded to a successful instance of its use in the east), how much more profit would there be in raising seed here than in purchasing it on the Atlantic Coast and paying freight rates to the Pacific.

While I confidently believe that, in time, oystermen will find more or less eastern oysters in Yaquina Bay, which have had their origin, naturally, in the plant introduced by the United States Fish Commission, it may take many years before this result is attained, and my chief, in fact, my only reliance for immediate results, now rests upon pond culture in connection with artificial fertilization. Artificial fertilization consists in mixing the ripe generative products from both sexes of oyster in receptacles filled with salt water, and when the developing eggs have reached the swimming stage of the embryo, or later, turning them into the bay, or better, into ponds where proper temperature and saltness can be maintained until they fix themselves as "spat," this spat to be later deposited in the bay.

With this idea of pond culture in mind, a cement pond was made last summer in the tide land with the expectation of testing its efficiency next summer.

Of all the bays of the Oregon Coast examined during the last three years, Yaquina Bay, though not an ideal place, appears most suited for successful propagation of this delicious bivalve, although an abundance of oyster food was found everywhere, and, as stated above, this oyster will undoubtedly grow finely in almost any bay on our coast.

I here insert, *seriatim*, and very briefly, the conditions found by the writer to prevail in the localities studied, together with a few tables of salinity and temperatures. The density of ocean water is 1.025.

NETARTS BAY.

Water of ocean saltness, unfavorable for eastern oyster embryos.

Date.	Locality.	Time.	Surface Density.	Temperature, °C.	Bottom Density.	Temperature, °C.	Tide.
Aug. 28	Netarts Bay, near mouth-----	6:45 P. M.	1.024 $\frac{1}{2}$	13	-----	-----	$\frac{3}{4}$ ebb.
29	Netarts Bay, near head-----	8:15 A. M.	1.024	15	-----	-----	Low.
29	Netarts Bay, near head-----	8:45 A. M.	1.024	15	-----	-----	Low.
29	Netarts Bay, on oyster beds-----		1.023	15	-----	-----	Extreme low.

Water so shallow that only surface density was obtained.

TILLAMOOK BAY.

Too salt and too cold in the body of the bay, and in the upper bay winter freshets and accompanying mud would undoubtedly prove fatal.

Date.	Locality.	Time.	Surface Density.	Temperature, °C.	Bottom Density.	Temperature, °C.	Tide.
Aug. 28	Hoquarten Slough-----	7:40 A. M.	1.002 $\frac{1}{2}$	15	-----	-----	Low.
28	Hoquarten Slough, mouth-----	9:30 A. M.	1.008	17	-----	-----	2 hours flood.
28	Tillamook Bay, jetty-----	10:00 A. M.	1.011	16	-----	-----	$\frac{3}{4}$ flood.
28	Tillamook Bay, off Bay City-----	10:30 A. M.	1.015	11	-----	-----	$\frac{3}{4}$ flood.
28	Hobsonville-----	11:25 A. M.	1.025	10	1.025	10	flood.
28	Garibaldi-----	12:30 P. M.	1.024 $\frac{1}{2}$	10	-----	-----	High.
28	Hoquarten Slough-----	2:10 P. M.	1.011 $\frac{1}{2}$	17	-----	-----	High.

ALSEA BAY.

Same remarks apply here which describe conditions at Tillamook.

Date.	Locality.	Time.	Surface Density.	Temperature, °C.	Bottom Density.	Temperature, °C.	Tide.
July 13	Slough at Waldport, one and one-half miles from mouth of bay	1:30 P. M.	1.0245	14	1.024 (6 feet)	14	High.
13	Waldport dock, one and one-half miles from mouth	2:00 P. M.	1.024	13	1.0245 (14 feet)	13	Ebb.
13	McKinney's Slough, three miles from mouth	2:30 P. M.	1.022	18½	1.022 (4 feet)	18	14 hours ebb.
13	Titus' Slough, four miles from mouth	3:00 P. M.	1.019	17	1.0235 (15 feet)	14½	2 hours ebb.
13	Nice's Cannery	3:45 P. M.	1.0232	16½	1.0232	16	½ ebb.

COOS BAY.

An ideal bottom for any oysters off Glasgow, and an abundance of food everywhere. But water too cold and too salt for eastern spawn except in extreme upper part of bay near Marshfield, where favorable conditions, very favorable, prevailed when I was there during the summer but when an excess of fresh water in the winter accompanied with mud, would be fatal to old and young Eastern Oysters. A possible danger from sewage in this vicinity must not be overlooked. Good bottom was also found in the north channel of Coos River, in the vicinity of Willamuch Slough. From North Bend up (1897), the writer found large numbers of dead shells of the native oyster, such as we have at Yaquina Bay, and at Shoalwater Bay, Wash., and recently the government dredge has disclosed tons of these dead shells, corroborating the prevailing impression that this oyster (*Ostrea lurida*) flourished here in great quantities, until killed by some catastrophe, a sudden and unusual deposit of mud, or possibly of ashes from the great fires of years ago. Before leaving Coos Bay the writer urged upon the citizens of that section the desirability of importing a quantity of these oysters from Yaquina, or Shoalwater Bay, and stocking Coos Bay. I take this opportunity to again advise such a move, feeling sure that it will result profitably.

Date.	Locality.	Surface Density.	Temperature, °C.	Tide.	Bottom Density.	Temperature, °C.	Tide.	Depth.
Aug. 10	Empire City	1.025 $\frac{1}{2}$	17 $\frac{1}{2}$	$\frac{1}{2}$ flood	1.023 $\frac{1}{2}$			
10	Marshfield	1.018	18	$\frac{1}{2}$ ebb	1.018 $\frac{1}{2}$	19	$\frac{1}{2}$ ebb	21 feet.
10	Isthmus Slough	1.015	20	Low	1.015	19		
11	Marshfield	1.015	19	Low	1.015	20	Low	12 feet.
11	One half mile below Marshfield	1.015	19	Flood	1.016	20		
11	Empire City				1.022	16	$\frac{1}{2}$ flood	13 feet.
11	South Slough	1.024	13 $\frac{1}{2}$	$\frac{1}{2}$ flood				
11	Life Saving Station	1.024	15	Ebb	1.024	14	Ebb	
11	Empire City	1.024	15	1 hour ebb				
11	Empire City	1.022	16	Low	1.022	15	Low	
11	North Slough				1.020	18	1 hour flood	
11	Empire City	1.022	15	$\frac{1}{2}$ ebb				
12	Pony Slough	1.022	60 F.	Low				
12								
12	Hay's Slough	1.021	18	2 hours flood	1.020	18	1 hour flood	9 feet.
12	Glasgow at dock	1.020	19	$\frac{1}{2}$ flood	1.021	19	$\frac{1}{2}$ flood	10 feet.
12	North Bend	1.022	18	$\frac{1}{2}$ flood				
12	Pony Slough				1.022	19	$\frac{1}{2}$ flood	2 feet.

WATER TEMPERATURES.

The following very complete list of water temperatures, made by George King of Oyster City, Yaquina Bay, under the writer's direction, and extending from January 1, 1897, to August 3, 1897, gives one a very good idea of the condition of the water of Yaquina Bay in the neighborhood of the eastern oyster plant. Low tide in this table, and high tide, do not mean necessarily exactly the lowest tide or exactly the highest tide, but approximately low or approximately high, as the case may be. I believe this is the most complete record of the water temperature of Yaquina Bay in existence, and as such, commend it to your favorable attention. It may be well to note here that the best temperature for eastern oyster spawn is from 70° to 80° Fahrenheit, and the most favorable density or saltness is from 1.012 to 1.016. It must be added further that a sudden change, either in the saltness or in the temperature of the water is exceedingly hostile to eastern oyster spawn. In the density tables given above, unless otherwise noted, the temperature is in degrees Centigrade. To find the equivalent in Fahrenheit, multiply the figure given by 9, divide by 5 and add 32.

Date.	Locality.	Tide.	Temperature, °F.		Depth.	Time.	Atmosphere, °F.	Remarks.
			Surface.	Bottom.				
1897,								
Jan. 1	Poole's Slough	High	48	49	18 feet		43	Clear.
2	Oyster City		48	50	12 feet		45	Clear.
3	Oysterville Flats		49	50	18 feet		44	Clear.
4	Poole's Slough	Low	49	49	9 feet			Rain.
5	Channel, Oyster City	Low	49	50	18 feet			
6	Oysterville Flats		49	50				
7	Channel, Oyster City		49	50				
8	Poole's Slough	High	48	49	14 feet			
9	Channel	High	48	49½	20 feet			
10	Poole's Slough	High	48	49				
11	Oyster City	High	48	49				
12	Oyster City	High	44	47	6 feet		34	
13	Oysterville	High	40	50	20 feet		47	
14	Oysterville	High	49	50	20 feet		47	
15	Oysterville	High	49½	50	20 feet		52	
16	Oysterville	Low	46	47	9 feet			Estimated 6 feet of fresh water.
17	Oysterville							Heavy rains, water fresh enough to drink.
18	Oysterville							Storm and rain, water fresh.
19	Poole's Slough		45	47				Freshets and storms to March 4.
20	Oysterville		45	47				

Mar.	4	Oysterville and Oyster City	Low	50	50	44	
	11	Poole's Slough, Oysterville and Oyster City	High	40	50		
	16	Milligan's Bend	Low	48	48	25 feet	
	18	Oyster City, Oysterville and Poole's Slough	Low	48	49	12 feet	
	21	Oyster City, Oysterville and Poole's Slough	Low	49	49		
	25	Oyster City, Oysterville and Poole's Slough	Low	49	49		
	31	Oyster City, Oysterville and Poole's Slough	Low	50	50		
Apr.	7	Oysterville and Oyster City	Low	50	50		
	9	Oysterville and Oyster City	Low	52½	52		50
	14	Oysterville, Poole's Slough and Oyster City	Low	54	54		63
	22	Oysterville, Poole's Slough and Oyster City	Low	55	55	12 feet	
	23	Oysterville, Poole's Slough and Oyster City	Low	56	56		
	25	Oysterville, Poole's Slough and Oyster City	Low	56	57	20 feet	54
	28	Milligan's Bend	Low	59	57	41 feet	
May	1	Oyster City		54½	54½		
	1	Oysterville, Poole's Slough and Oyster City		54½	54½		
	3	Oysterville and Poole's Slough		59	59		
	6	Oysterville and Oyster City	Low	59	59		
	12	Oysterville		52	52	500 P. M.	
	12	Docks at Yaquina		55	52		
	12	Oyster City		62	60		
	12	Poole's Slough, mouth		60	59		
	13	Poole's Slough	High	58	57	1000 A. M.	
	13	Oysterville	High	59	57		
	13	Oyster City	High	58	57		
	14	Oyster City	One-half ebb	63	59	700 A. M.	
	15	Oysterville		62	62		
	15	Oysterville and Oyster City	High	60	59		
	17	Oysterville and Poole's Slough, mouth	Extreme low	63	62	600 A. M.	
	17	Milligan's Bend		62	60		
	18	Oysterville, Poole's Slough and Oyster City	Low	64	64		
	19	Oysterville, Poole's Slough and Oyster City	Low	64	64		
	20	Oysterville, Poole's Slough and Oyster City	Low	64	64		
	21	Oysterville, Poole's Slough and Oyster City	Low	64	64		
	23	Oysterville, Poole's Slough and Oyster City	Low	62	61		
	24	Oysterville and Oyster City	Low	62	60		
	25	Poole's Slough and Oysterville	High	59	57	300 P. M.	
	27	Oysterville and Oyster City	Low	63	61		
	28	Oyster City		63	61		
	29	Oysterville, Poole's Slough and Oyster City	High	60	58		
	30	Oyster City, off dock	Low	63			
	31	Oyster City, off dock	Low	63			
June	1	Oyster City, off dock	Low	64			
	2	Oyster City, off dock	Extreme low	65			
	2	Oyster City, off dock	High	61			
	3	Oyster City, off dock	Extreme low	62			
	3	Oyster City, off dock	High	61			
	4	Oysterville and Poole's Slough	Extreme low	65			
	4	Oyster City, off dock	High	61			

Heavy rains,
strong east wind,
heaviest rains of
season.

Raw and cold.
Bright and warm.

WATER TEMPERATURES—CONCLUDED.

Date.	Locality.	Tide.	Temperature, °F.		Depth.	Time.	Atmos- phere, °F.	Remarks.
			Surface.	Bottom.				
1897. June 5	Oyster City, channel	High	62	61				
6	Oyster City, off dock	Low	68					
6	Oysterville	Extreme low	68					
6	Poole's Slough	Extreme low	69					
6	Oysterville	High	62	61				
7	Oysterville	Low	65	64				
7	Oysterville	High	62	61				
8	Oysterville	Low	65	64				
9	Oyster City	High	62	61		A. M.		
9	Oyster City	High	59	57		P. M.		
10	Oyster City	High	59	57				
11	Oyster City	One-half flood	62	61		7:00 A. M.		Rainy, wind south- west.
12	Oyster City and Oysterville	High	63	61		11:00 A. M.		Clear, wind south- west.
13	Oyster City, off dock	Low	63			7:00 A. M.		
13	Oyster City, off dock	High	60	57		1:00 P. M.		
14	Oysterville and Oyster City	Low	65	61				
14	Oysterville and Oyster City	High	63	61				
15	Oysterville and Oyster City	Extreme low	65	64				
15	Oysterville and Oyster City	High	62	61				
16	Oysterville and Oyster City	Extreme low	63	61				
16	Oysterville and Oyster City	High	61	59		12:00 M.	57	
17	Oysterville, Oyster City and Poole's Slough	Extreme low	64	63			54	
17	Oysterville and Oyster City	High	59	57				
18	Oysterville and Oyster City	Low	64	63				
18	Oysterville and Oyster City	High	58	57				
19	Oysterville and Oyster City, channel	Low	65	64				
19	Oysterville and Oyster City, channel	High	60	59				
20	Oysterville and Oyster City, channel	Low	63	62½				
20	Oysterville and Oyster City, channel	High	59	57				
21	Oyster City	High	60	59½				
21	Oysterville and Oyster City	Low	65	64				
22	Oysterville and Oyster City	High	60	60				
23	Oysterville and Oyster City	Low	66	65				
23	Oysterville and Oyster City	High	62	61½				
24	Oysterville and Oyster City	Low	67	66½				
24	Oysterville and Oyster City	High	63	62				
25	Oyster City	Low	66½	66½				

SECOND CONSIGNMENT OF EASTERN OYSTERS.

Since the first consignment in 1896, the United States Fish Commissioner, George M. Bowers, has been liberal enough to present the state with ten barrels more of the variety known as Princess Bays, making in all thirty-two barrels of eastern oysters donated the state and planted in Yaquina Bay. Through the courtesy of President John J. Valentine, of the Wells, Fargo Company, this second consignment was brought from New York to Yaquina free of charge. The United States Government bore the expense of transporting the first consignment.

A telegram from Auburn, California, received at Eugene, October 30, advised the writer that the oysters would pass Sacramento that night, bringing them into Albany on the morning of November 1, where they were met and arrangements made with the courteous officials of the Corvallis and Eastern Railroad to have them unloaded at Oysterville. They were planted the next morning, some with the former plant, and some farther up the bay in deep water. This consignment left New York City on October 25; they were, therefore, just eight days en route. Not a single dead oyster was found in the entire lot. The consignment weighed in the vicinity of two thousand five hundred pounds.

The small sum (\$300) appropriated by our last legislature for this work having been nearly exhausted, the United States Fish Commissioner, George M. Bowers, has practically consented to honor bills representing the expenses of next summer's work. This generosity on the part of the fish commissioner is highly appreciated, for, otherwise, the work would be at a standstill during the coming summer, at which time it is now intended to make a thorough trial of the concrete pond constructed last season.

CONDITIONS OF THE NATIVE OYSTER INDUSTRY.

Yaquina Bay oystermen get at present \$2.50 to \$2.75 per sack for native oysters, a San Francisco firm having contracted with most of the oystermen for this season's output at the latter figure. The oysters on the native beds are so closely worked now that one-half a sack on a tide is consid-

ered fair work, though one sack is sometimes obtained. In the past, the business has been much more profitable than at present. The oysters have dwindled in numbers and in size, owing to a too persistent tonging, together with a lack of foresight on the part of the oystermen. If they could unite in a determination to forbid all tonging for two years or more on certain reserved portions of the natural beds, and persist for a number of years in such a plan, using care with the unmarketable seed, besides taking the best possible precautions along modern lines for catching "spat," I believe the industry could be restored to something like what it was ten years ago. But if the present methods continue, I will predict the extinction of the industry before many years. There are at present less than twelve men oystering at Yaquina Bay, yet if all of that small number depended for their living on selling oysters, they would fare badly. Some of them turn their attention to salmon fishing during a part of August, September, October and November. The oystermen who do not fish claim, and some of those who do fish acknowledge, that while drifting at low tide the weighted nets drag the bottom and in passing over the oyster beds disturb the oysters at a time when the oyster spat is still young, delicate and easily injured, besides rolling the adult oysters about at a time when they should be let alone, namely, the spawning period. From necessarily limited observations on my own part and from careful inquiry from reliable parties, I am inclined to think that this complaint is well founded.

The oystermen have been in the past united in the Yaquina Bay Oystermen's Association, which, in 1868, drew up certain laws regulating oystering, which laws were afterwards made state laws by the legislature. In accordance with these laws, one is obliged to have resided twelve months in the state and six months in the county before he can tong oysters. Each oysterman can obtain from the state for use as private bed two acres of tide land, and only two.

Respectfully,

F. L. WASHBURN.
State Biologist.



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